

ARKANSAS FORESTS—THE TIMBER RESOURCE

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INTRODUCTION

Arkansas has bountiful forest lands totaling 18.3 million acres. In fact, Arkansas is over 50 percent forested, which is much higher than the United States average of 21 percent (fig. 1). Many of Arkansas' forested areas are timberlands or commercial forests, meaning that each acre can produce a minimum of 20 ft³ of wood volume per year. Lower percentages were noted for woodland forests (other than timberlands) in Arkansas compared with the United States averages. These lands have provided Arkansans with employment, areas for recreation, scenic beauty, and opportunities for investments.

Arkansas has developed a strong wood-based industry because it has historically had a vast acreage of forest lands. Wood-based employment is very important to Arkansans. A study by Schallau and others (1987) found Arkansas to be the most timber-dependent State in the South with regard to employment. The forest products industry, which accounts for one of every six basic jobs, is the second largest component of Arkansas' economic base. Direct employment related to wood-based manufacturing exceeds 40,000 Arkansans with an annual payroll of \$700 million, the largest of any manufacturing sector (Leister and others 1988). Twenty-one counties (28 percent) in Arkansas have wood-based industry as their number one manufacturing employer. Additionally, 23 counties have wood-based industry as the second or third largest manufacturing employer. Thus, 44 of the 75 counties in

Arkansas rely heavily on wood-based manufacturing employment (USDC Bureau of the Census 1991).

With wood-based industries making up such a substantial portion of Arkansas' economy, it is imperative that current forest inventory data be available for making good decisions regarding the use of Arkansas' forests. Currently, the Southern States rely on USDA Forest Service Forest Inventory and Analysis (FIA) data for forested inventories. These inventories are presently on a 7-yr cycle in Arkansas. Typical measurements include species, size class, number of trees, growing-stock volume, removal volume, and ownership categories and volume. Volume is represented by the growing-stock volume, which is the cubic-foot volume of sound wood in trees at least 5.0 in. in d.b.h., from a 1-ft stump to a minimum 4.0-in. top diameter measured outside the bark (Hines and Vissage 1988).

In addition to growing-stock volume, the state of existing forest stands is important. One method of evaluating a stand's condition is to examine the stocking of trees on an acre. Overstocking occurs where the forest has more trees than it can sustain over time. Crowded conditions weaken trees, making them more susceptible to attack from insects or diseases. The other extreme is nonstocked forest land. These areas do not have many desirable trees on the site and, of course, this condition is not conducive to the continued success of the wood-based industry and economy in Arkansas. A third condition is an understocked stand of trees. Desirable trees are found, but the site is capable of growing more trees than currently exist. Each of these conditions can be improved with good management practices.

Two conditions may exist in the forest, which suggest a well-balanced mix of trees. These are well- and fully stocked stands, both highly desirable forest conditions.

Recent trends in the State's forest resources and their use concern the forest product industry leaders, researchers, and planners. One of these concerns is the status of the forest resources resulting from increased harvesting activity. Stands have recently been harvested at a more rapid rate to meet the demand for wood products caused by restricted wood supplies from other areas of the country.

Thus, it is prudent to evaluate the status of the forest resources. Long-range planning and sustainable forestry have to evaluate the forest resources in order to meet the current demand while providing for tomorrow's

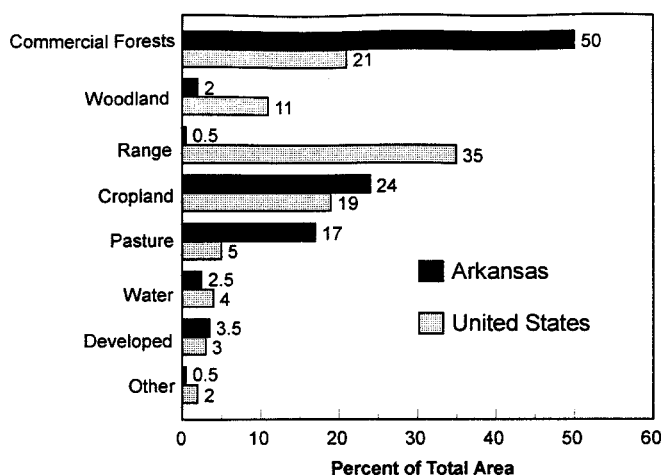


Figure 1—Percentage of land use in Arkansas and the United States, 1987. (Source: USDC Bureau of the Census 1991).

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opportunities. The changes occurring throughout the State with regard to the timber resources on Arkansas' forested lands are examined in this study.

METHODOLOGY

The overall objective of this study is to determine the current status of Arkansas' forest lands related to past forest inventories. More specifically I want to: (1) evaluate forest land ownerships by physiographic region, (2) examine stocking levels, (3) determine if tree volumes are increasing, and (4) compare net annual growth with net annual removals and tree mortality.

Forest inventory and land ownership patterns were recovered from various sources, plotted, mapped, and analyzed. Transformations of the data were performed as necessary to convert the data to the same basis. The USDA Forest Service has periodically surveyed all of the Southern States including Arkansas, compiling many forest resource statistics. The data are averaged over the intersurvey period to derive average annual numbers. Evaluating several survey reports can indicate the status and trends of the State's forest resources. Thus, the emphasis of this report is the 1996 forest inventory. However, its full appreciation cannot be ascertained without examining past inventories. Data were entered into spreadsheets for analysis and linked to GIS for spatial analysis.

RESULTS

Ownership

The ownership pattern for Arkansas' forest lands is similar to that of other Southern States, in that most are privately owned. Arkansas' largest forest land ownership group, the nonindustrial private forest (NIPF) landowners own 57.9 percent of the total forested acreage (fig. 2). There are estimated to be over 160,000 individuals who own land and are classified as NIPF owners (Arkansas Forestry Association n.d.). Forest industry companies are the second

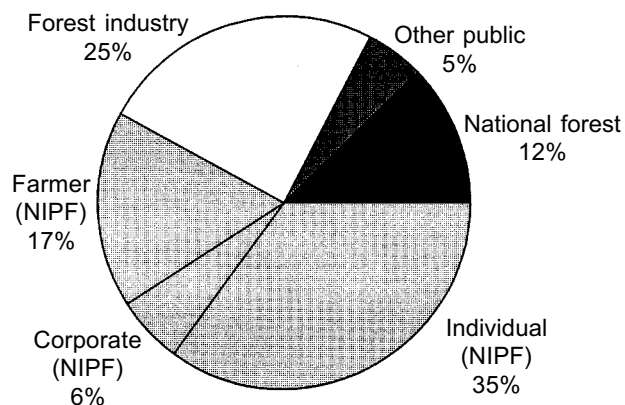


Figure 2—Arkansas timberland ownership, 1996. (Source: Rosson and others, 1997a)

largest ownership group of Arkansas' forest lands with 25 percent of the forested acres (Rosson and others 1997b).

Public ownership is land controlled by the U.S. Government, State Government, or municipalities. In Arkansas, the largest public landowner is the USDA Forest Service, whose national forests total 12 percent of the total. Other public timberland totals 921,000 ac or 5 percent of the total. These other public lands are managed by Federal agencies, such as the U.S. Fish and Wildlife Service, Corps of Engineers, National Park Service, State agencies, or municipalities (Rosson and others 1997b).

Arkansas is divided into four physiographic regions including the Delta, Coastal Plain, Ouachita, and Ozark (fig. 3). Ownership patterns differ from one physiographic region to another. Private ownerships including NIPF owners, and forest industry companies own the largest portion of the Coastal Plain region of south Arkansas (fig. 4). In fact, they own 3.27 and 3.42 million ac, respectively. Ninety-seven percent of the Coastal Plain region is privately owned (Rosson and others 1995).

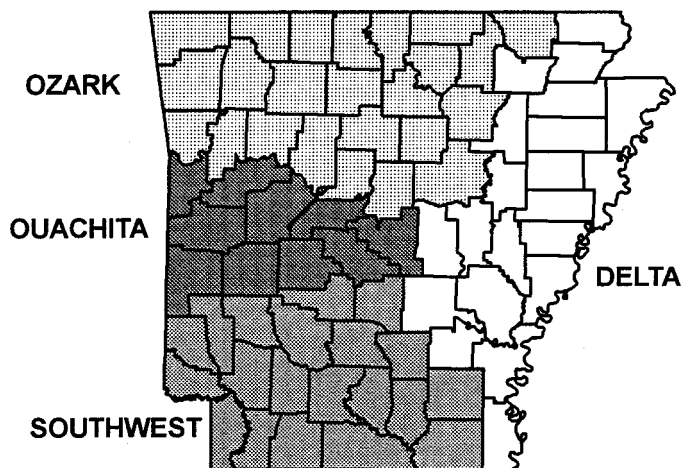


Figure 3—Physiographic regions of Arkansas. (Source: Hines and Vissage 1988)

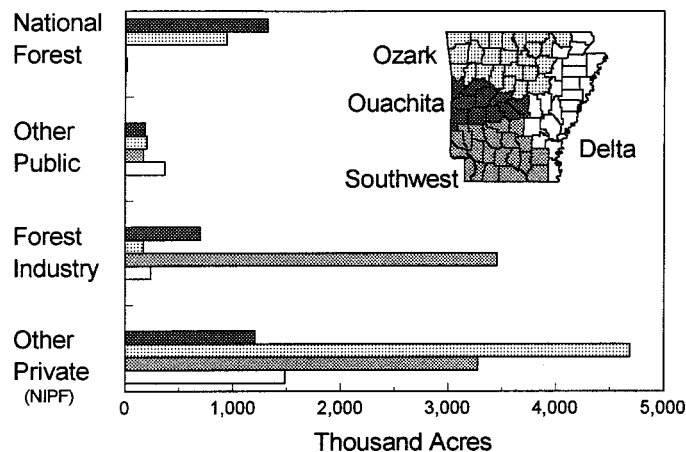


Figure 4—Forest land ownership by Arkansas' Physiographic Regions, 1996. (Source: Rosson and others, 1997a)

The Ouachita region has a large block of Federal public ownership, the Ouachita National Forest, under the management of the USDA Forest Service. There are 1.3 million ac in the national forests. This region also finds significant private owners including forest product companies with 679,000 ac and NIPF ownerships with 1.2 million ac (Rosson and others 1997).

NIPF landowners have the largest portion of the forested areas in the Ozark region (78 percent of the forested acres totaling 4.68 million). There is a sizable national forest in this region containing 941,000 ac. A distinct difference between the Ozark region and the Ouachita and Coastal Plain regions is the small acreage owned by forest industry companies. Forest industry companies own 174,000 ac in the Ozark region (Rosson and others 1997b).

The fourth physiographic region, the Delta, is owned largely by NIPF landowners with some public and forest industry ownerships. The NIPF landowners have 1.48 million ac, which comprise 70 percent of the total forested land. Forest industry companies own 241,000 ac of timberland (Rosson and others 1997a). Thus, ownership patterns vary by physiographic region.

Forest Stocking Levels

Total growing-stock volume in Arkansas was 18.9 billion ft³ in 1988. The highest percentage of tree volume in Arkansas is in hard hardwood trees such as oaks and hickories (42.7 percent). Soft hardwood trees including sweetgum, cottonwood, and elms totaled 15.5 percent of the cubic-foot volume. Pine volume totals 40 percent, which is less than hardwood—a fact many Arkansans do not realize. Other softwoods, primarily cypress and cedar, make up the rest with 1.8 percent of the total (Hines and Vissage 1988). The 1997 data shows 21.6 billion ft³ of growing-stock volume (fig. 5). This volume is comprised of 41 percent pine, 57 percent hardwood, and 2 percent other softwood (Rosson and others 1997b). Thus, since 1988, the actual

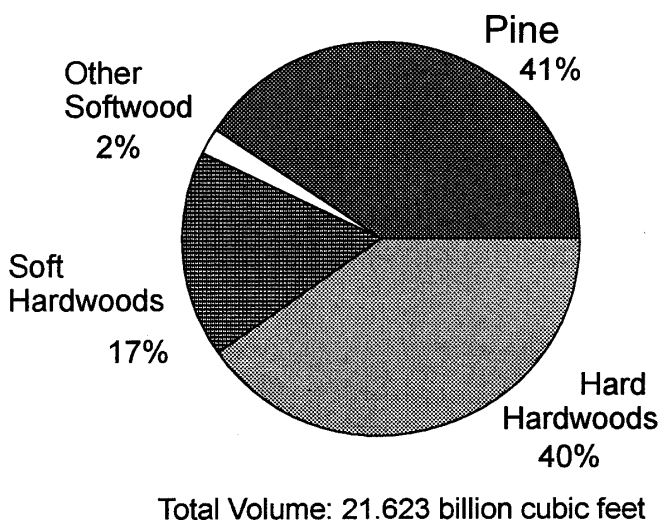


Figure 5—Growing stock volume in Arkansas, 1996. (Source: Rosson and others, 1997a)

volume of wood has increased on forested acres in Arkansas.

Figure 6 shows stocking levels by ownership category. NIPF landowners have 2.7 million ac in an understocked condition of trees and 144,000 nonstocked acres (Rosson and others 1997b). This combination totals 70 percent of the acres in Arkansas that could be improved by managing the number of trees growing on these areas. Thus, these owners have the greatest opportunity to improve their stocking levels and thereby enhance the value of their forest lands. Forest industry owns 848,000 ac that need stocking improvement, which is 19 percent of the acres needing improvement. This shows that the private sector can contribute substantially to the growth of trees in Arkansas.

Management and use of nonindustrial forests depend upon the individual owner's wants and needs. The NIPF landownership segment is often difficult to predict due to the large number of owners. There is abundant opportunity to increase the growing stock of trees on private lands, especially NIPF timberlands.

Tree Volume

Pine and hardwood tree volumes have increased since the 1988 survey. Additionally, volume of pine trees has increased 4.1 billion ft³ since 1952. In fact, pine volume has almost doubled since the early 1950's and now stands at 8.7 billion ft³. The volume of hardwood trees was about 9.4 billion ft³ in 1952 and steadily decreased until the early 70's when it was 8.8 billion ft³ (Van Sickle 1970). Since 1970, hardwood volume has risen to the present volume of 12.3 billion ft³, an all-time high (Rosson and others 1997b).

Figure 7 shows pine inventory for 1968, the projected inventory for 1998, and the present 1996 inventory. Pine volume was 6.4 billion ft³ in 1968 and now totals 8.7 billion ft³. The projection made approximately 30 years ago was to have a pine inventory of 7.9 billion ft³ by 1998 (Van Sickle

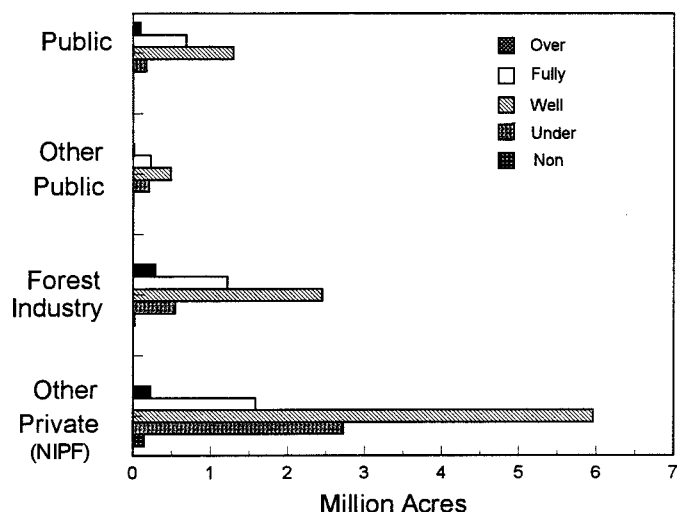


Figure 6—Area of timberland in Arkansas by stocking class and ownership, 1996. (Source: Rosson and others, 1997a)

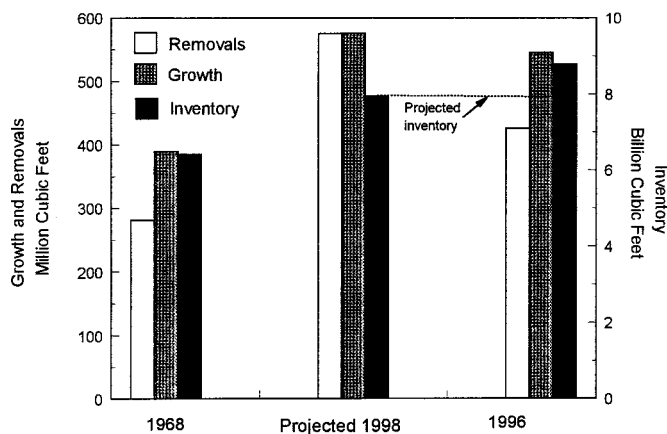


Figure 7—Net annual growth, average annual removals, and inventory of pine species in Arkansas forests. (Source: Van Sickle 1970, Rosson and others 1997a).

1970). This projection was somewhat conservative in its estimate. However, the projected level of growth and removals was too high as was evident by the 1996 survey. Removals were 281 million ft³ in 1968 and 426 million ft³ in 1996. The projection estimated that 575 million ft³ of pine volume would be harvested in 1998. This projection overestimated total for pine removals by 35 percent.

The 1998 projection for hardwood inventory volumes was conservative. Hardwood inventory stands at 12.3 billion ft³ whereas the projection estimated the inventory at 10 billion ft³. Removals of hardwood are less today than during the late 1960's. In 1968, 289 million ft³ of hardwood volume was removed whereas the 1996 level was 281 million ft³. In 1970, Van Sickle projected hardwood removals would reach 440 million ft³ by 1998, which overestimated the use of hardwood trees by 57 percent (fig. 8). There have been some new markets for hardwood trees that did not exist until the mid-1990's, which might increase the volume of hardwood trees being harvested in Arkansas.

Stand type refers to the dominant trees occupying a site. For example, a pine type is an area with pine trees making

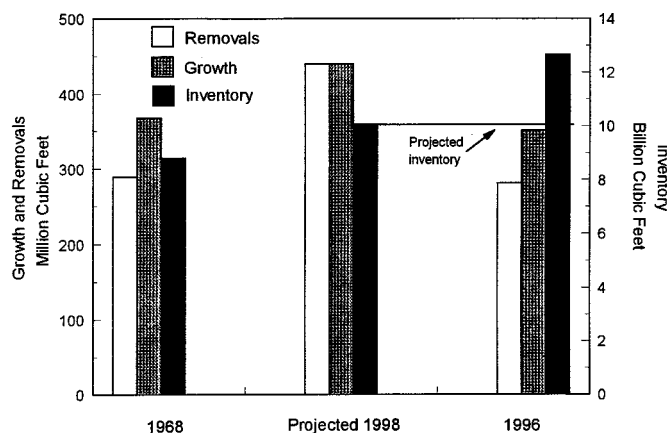


Figure 8—Net annual growth, average annual removals, and inventory of hardwood species in Arkansas forests. (Source: Van Sickle 1970, Rosson and others 1997a)

up over two-thirds of the larger or dominant trees. Pine trees are not the only trees, but comprise the majority of the trees. Since the 1968 survey, most stand types have remained fairly constant including oak-pine, oak-gum-cypress, and elm-ash-cottonwood. However, the acreage of pine stands has increased (fig. 9). A corresponding decrease has occurred in the oak-hickory stand types.

The size of the trees is larger now compared to 1968. Forested acres with sawtimber-sized trees (12 in. in diameter and larger) have increased from 5.4 to 8.4 million ac. There has also been a slight increase in acres with poletimber-sized trees (5 to 12 in. in diameter) from 4.7 to 5.4 million ac. The seedling and sapling-sized trees comprised 7.9 million ac in 1968 and 4.4 million ac in 1996 (fig. 10). The forests in Arkansas today have more larger

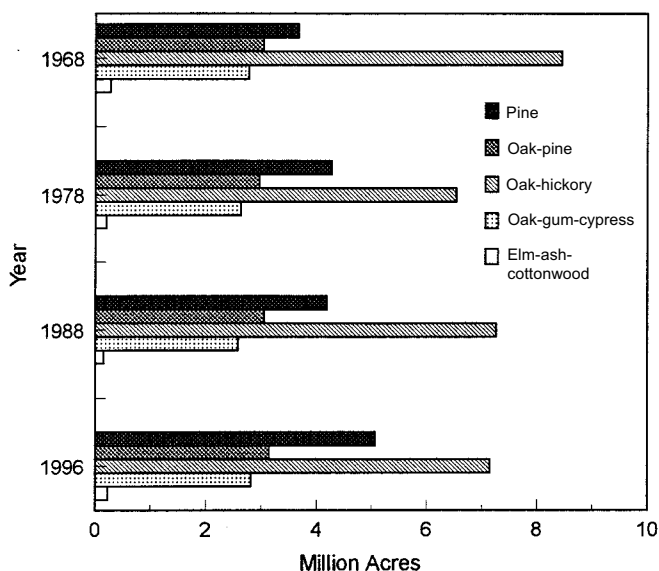


Figure 9—Area of commercial forest land by forest types in Arkansas. (Source: Van Sickle 1970, Quick and Hedlund 1980, Hines and Vissage 1988, Rosson and others 1997a)

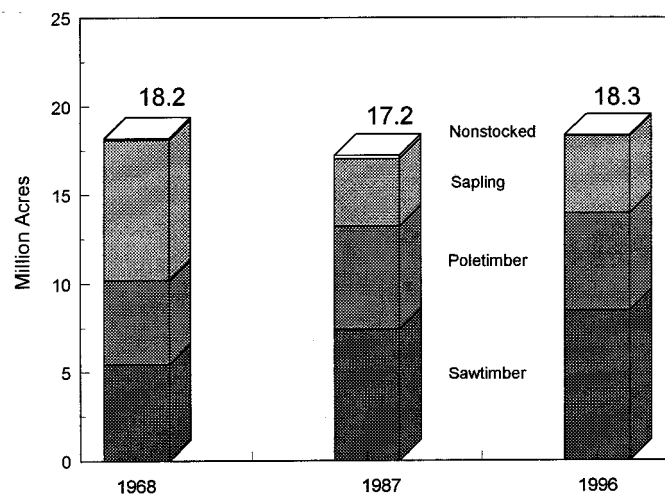


Figure 10—Area of commercial forest land in Arkansas by stand size. (Source: Van Sickle 1970, Hines and Vissage 1988, Rosson and others 1997a)

trees growing on them in the poletimber- and sawtimber-sized classes compared to 1968.

Growth and Removals

Another factor in determining the present condition of the forest is the net growth/removal ratio. Simply stated, this means—how much tree volume the forest is growing compared to the amount being removed. Mortality volumes are already subtracted from growth, which means that the net annual growth is the wood growth minus mortality. Dividing growth by removals provides a ratio that can describe the pressure being exerted on the forest by humans. Figure 11 shows the growth/removal volumes by major species groups. The statewide totals indicate that only sweetgum trees have removals exceeding growth. Figure 12 shows that statewide, for both pine and hardwood species, growth exceeds removals. The 1988 FIA inventory revealed growth/removal ratios for pine volumes of < 1 to 1

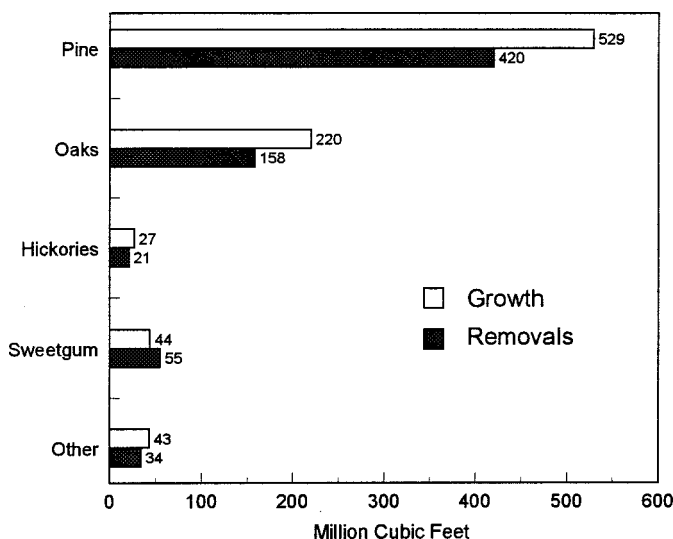


Figure 11—Arkansas growth and removals by selected tree groups, 1996. (Source: Rosson and others 1997a)

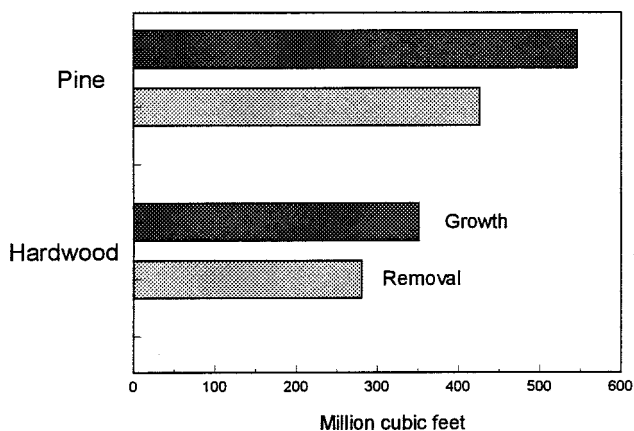


Figure 12—Net annual growth and average annual removals in Arkansas between 1986 and 1996. (Source: Rosson and others 1997a)

(Hines and Vissage 1988). However, in 1996 there was more pine volume being grown whereas the level of removals remained fairly constant at the 1988 level.

There is a high demand for Arkansas' pine volume to be converted into building materials and paper products. The 10-yr average removals in Arkansas ending in 1996 revealed that removals were 419.8 million ft³ (Rosson and others 1997b). Growth/removal ratio comparisons for all pine species and products show that nine counties are in the low condition (fig. 13). The low condition indicates that growth is exceeding removals; therefore, inventory decreases. This is a dramatic change from the 1988 FIA survey where 22 counties had growth levels less than removals.

Statewide hardwood growth/removal rates are shown in figure 12. Hardwood inventories increase where growth rates exceed removals, and, in some areas, this surplus growth is substantial. However, these comparisons are for the State as a whole, whereas individual counties may have unique pressures on their hardwood resource that are masked by the statewide totals. In 1988, Hines and Vissage noted that 12 counties had growth/removal levels for hard hardwood species at the low level where the inventory was being reduced. Figure 14 illustrates the 1996 survey where 23 counties had growth levels lower than removals (Rosson and others 1997b).

Soft hardwood trees had low growth/removal conditions in 14 counties in 1988, whereas the 1996 survey had 27 counties (fig. 15). Hardwood trees are under pressure in isolated areas, but statewide, a positive growth/removal ratio exists. As evidenced by the survey data, the pressure on the hardwood resource has not equaled the pressure on the pine resource in Arkansas (Hines and Vissage 1988, Rosson and others 1997b). However, a marked increase in the utilization of hardwood trees is apparent from 1988 to 1996 due to new demands for hardwood fiber.

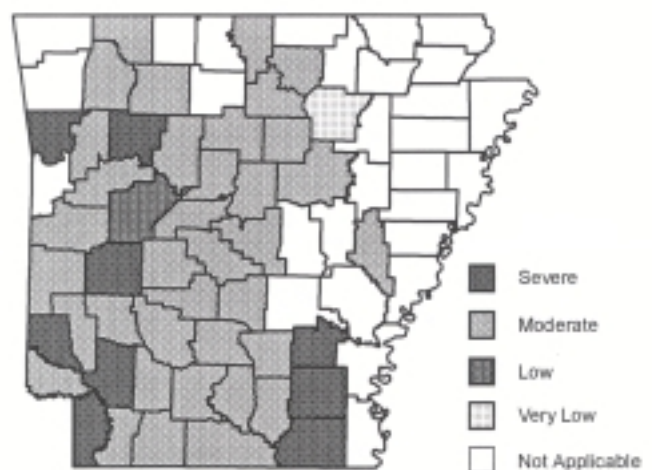


Figure 13—Growth/removal ratios by Arkansas counties for all pine species and products. (Source: Rosson and others 1997a)

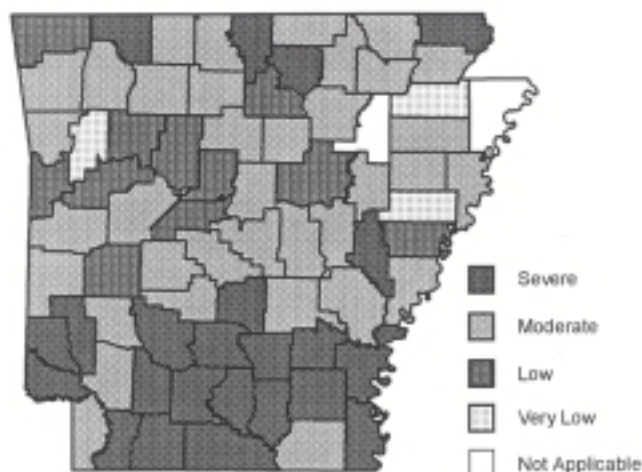


Figure 14—Growth/removal ratios by Arkansas counties for all hardwood species and products. (Source: Rosson and others 1997a)

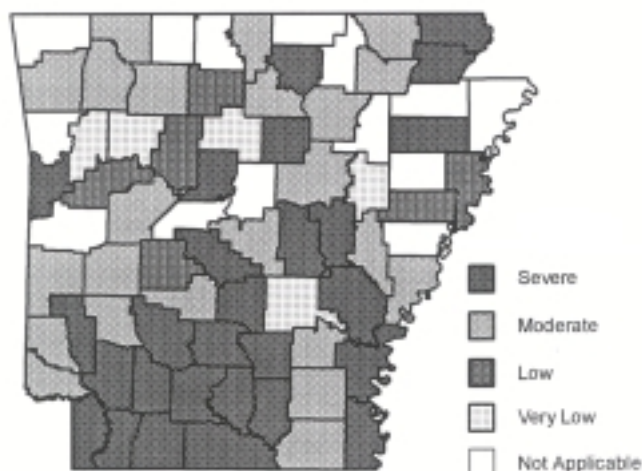


Figure 15—Growth/removal ratios by Arkansas counties for all soft hardwood species and products. (Source: Rosson and others 1997a.)

CONCLUSIONS

Private ownership of forest lands makes up the largest segment of Arkansas owners. These forests have provided many benefits over the years and are still growing strong. Along with the positive aspects of Arkansas' forest lands, some negatives do exist, including poorly and nonstocked forest lands, primarily on NIPF lands. Gains in tree-stocking levels and some reforestation efforts could provide additional benefits to Arkansas by increasing the growth and stocking levels on forest lands. Increased tree volumes on forest lands could lead to possible mill expansions, wood volumes for export markets, or the development of new wood-based facilities, thereby adding jobs and benefits to Arkansas' economy. Additionally, the increase in the number of trees will be providing other benefits such as aesthetics and wildlife habitat.

Some other concerns include local areas of harvesting where removals exceed growth. Whereas the statewide numbers are good for growth and removals, there are counties where the growth/removal ratio is < 1 to 1. The number of counties where removals exceed growth has doubled since the 1988 survey for hardwoods. A decrease in the number of counties where pine removals exceeded growth was noted since the 1988 survey.

The FIA inventory of Arkansas' forest lands provides valuable information regarding ownership, tree size, and tree types. The growth/removal tables indicate the harvesting pressure on Arkansas' forested lands for wood products. The ability to examine previous surveys with current surveys indicates the status of Arkansas' forests today.

Some Important Inventory Facts

1. Arkansas' timberland acreage has increased by 1 million ac since the 1988 survey and is approximately the same as the 1968 survey acreage.
2. Pine inventory has increased, and growth exceeds removals and mortality, statewide.
3. Hardwood inventory has increased, and growth exceeds removals and mortality, statewide.
4. Nonstocked acres are fewer than the 1988 survey.
5. Arkansas' sawtimber acreage has increased since the 1968 survey whereas seedling and sapling acres have decreased.
6. Acreage dominated by pine trees has increased since the 1968 survey, whereas acreage comprised of trees in the oak-hickory category has decreased.
7. Forested acres represented by bottomland hardwood species (oak-gum-cypress and elm-ash-cottonwood) have remained fairly constant since the 1968 survey.

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